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COMPOSITE POLYMERIC MATERIALS BASED ON POLYCAPROLACTONE WITH ADDITION OF MODIFIED AMINOGRAPHENE FOR TISSUE ENGINEERING

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Abstract. The restoration of bone tissue is a physiological process that allows cracks and fractures to heal, however, with the loss of large volumes of bone due to various pathologies, congenital defects, malignant and benign formations, mechanical injuries and bone diseases (osteomyelitis, tuberculosis), the regeneration of bone defects in a natural way is difficult or even completely not possible [1]. A promising solution to this task is the use of biodegradable polymers in the form of various matrices: films, plates or scaffolds for subsequent cultivation of special cells on their surface and filling the damaged area with them in order to restore bone architecture [2].

In present work, we have been focused on the preparation of composite polymer materials representing films based on poly-ε-caprolactone (PCL) filled with aminographene modified with poly(glutamic acid) (PGlu). The further preparation of such composites as 3D-materails will allow their application as scaffolds for the bone tissue regeneration.

In the course of the study, PGlu and high-molecular PCL were synthesized and characterized by the ring-opening polymerization. A method for modifying aminographene with poly(glutamic acid) was developed and the obtained filler was characterized by several physico-chemical methods. The composites based on PCL with different contents of PGlu-modified and unmodified aminographene (1 and 3 wt%) were prepared. PGlu was selected because of its ability to stimulate the natural mineralization during bone regeneration. For the obtained composite films, the surface morphology and tensile mechanical properties (Young's modules, yield stresses, tensile strengths) were studied. It was established that an increase in the amount of filler favored to the elastic modulus growth. Thus, by varying the amount of PGlu-modified graphene, it is possible to obtain the material with the necessary mechanical parameters and vary them in accordance with the requirements for the regenerated type of bone tissue.

References

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